INSTRUCTION MANUAL

MODEL H-90

NJE CORPORATION

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345 Carnegie Ave.
Kenilworth, N.J.

INSTRUCTION MANUAL

FOR

H-LINE

MODEL H-90

SERIAL _____

HIGH VOLTAGE POWER SUPPLY

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CORRESPONDENCE AND ORDERING SPARE PARTS

1. Each NJE Power Supply has an identification lable on the rear of the chassis which bears the model and serial number of the particular unit.

2. When requesting engineering data, reference should be made to the model and serial number and the component symbol number as shown on the applicable schematic.

3. When ordering spare parts, the information outlined in paragraph 2 should be given in addition to the NJE Part No. that appears on the parts list.

WARNING

THIS EQUIPMENT EMPLOYS VOLTAGES WHICH ARE DANGEROUS AND MAY BE FATAL IF CONTACTED BY OPERATING PERSONNEL. EXTREME CAUTION SHOULD BE EXERCISED WHEN WORKING WITH THIS EQUIPMENT.

UNPACKING INSTRUCTIONS

The complete power supply shipment consists of a small carton containing the rectifier tubes, accessory parts and instruction literature, and a wooden crate containing the chassis and cabinet. (Supplies with output voltages of 50KV or higher will have an additional wooden crate, since the high voltage circuitry in these supplies is mounted separately in a steel tank to permit immersion in oil.)

Open the small carton first. Using a short, sharp knife, carefully cut the sealing tape along the center seam and the short edges of the carton top. Remove the spare instruction manual and the packing slip (in envelope) from the carton. Then remove the small parts and rectifier tubes, checking each item against the shipping list.

Open the crate (or crates) by withdrawing the nails with a nail puller or similar tool. Do not use a pinch bar or hammer, and do not pry against the equipment itself when detaching the crate sides.

As soon as the equipment is unpacked, a thorough visual inspection should be made. When the unit leaves the factory it is thoroughly checked, both electrically and mechanically, and is warranted to be in perfect operating condition. However, we cannot guarantee that no damage will be incurred during shipment. Any evidence of mishandling, such as broken, deformed or missing parts, should be brought to the attention of the shipping agency immediately, and a claim should be entered. Open the top and rear cabinet doors and inspect all components and wiring, both on the chassis and on the front panel. If the high voltage components are mounted in a separate steel tank, they can be inspected as follows:

1. Using an open-end or box wrench, remove the bolts around the perimeter of the tank cover.

2. Lift the cover and its attached frame from the tank, using a hoist if available, then rotate the assembly slightly and lower it carefully until it rests upon the top flange of the tank. If a hoist cannot be obtained, and alternate procedure is to slip screwdrivers or bars through the eye-bolts in the cover and lift the assembly far enough to permit gripping the edge of the cover. Three men will be required for this operation.

3. Inspect the components and tank carefully, then replace the allembly in the tank. Do not install the cover bolts, since it will be necessary to open the tank again later when installing the rectifier tubes. The tank should remain covered in the interim, to prevent foreign matter from entering the unit. Contemination of the transformer oil to be used in the tank can impair its insulating properties.

UNPACKING INSTRUCTIONS (Continued)

The packing material should be saved until the supply has been performancetested, since the equipment should be returned in its original containers if repairs are necessary.

We strongly urge that you take time to read the entire instruction manual, before proceeding further with the assembly and operation of the equipment.

Specifications and General Description

Model N-50

Input: 117 volts 10%, 60 cycles/sec, single phase at approximately 15 amperes, 75% power factor, at full load.

Output: Continuously variable by front panel control from 0 to 150K volts dc at 0 to 5 milliamperes.

Ripple: 2% RMS at full voltage and load. Ripple voltage is directly proportional to load current, and independent of output voltage.

Regulation: Line, none provided, output voltage varies directly with line voltage. Load, approximately 30 % no load to full load, at maximum output voltage. Regulation is fixed in magnitude, but increases in percentage, as output voltage is lowered.

Internal resistance: 6 Megohms at dc.

Meters: 1. Kilovoltmeter, 0-40/80/160 Kilovolts dc.
2. Milliameter, 0-.5/2/5 Milliamperes dc.

Both meters with 2% initial calibration, 4½" rectangular case.

Housing: 1. CONTROL SECTION: Deluxe relay rack cabinet for standard 19" wide panels.
Dimensions: 22" wide X 18" deep X 21" high
Weight: 100 lbs.
Finish: Dark gray hammertone cabinet, light gray hammertone panel.
2. HIGH VOLTAGE SECTION:
Dimensions: 30" X 30" X 30" high
Weight: 500 lbs.
Oil Requirements: 100 gal. 25KV test rating transformer oil.
Output Cable: 15 feet of RG/8U coaxial cable.
Interconnecting cables: 10 feet of multi-cond. cable
Casters: 4" D wheel

Polarity: Reversible: Output may be set for either positive or negative voltage with respect to ground.

Controls:	Function	Component
	Mine Power (on-off)	Circuit Breaker (Manual)
	High Voltage Start	Push-button
	High Voltage Stop	Push-button
	High Voltage Control	Potentiometer
	Push-to-reset after overload or over-voltage	Push-button
	Overload Trip Adjust	Potentiometer
	Meter polarity selector (plus-minus)	Rotary Selector switch
	Meter range selectors (3)	Rotary selector switch
Pilot Lights:	HV Status Indicators	(Incandescent)
	HV Ready	Green
	HV Start	Red
	Overload	Blue
	Overvoltage	White
	Control Status Indicators (Neon)	
	Control fuse open	
	Primary fuse open	
	Safety interlock open	
	Set to "0" interlock open	

Duty: Continuous. Adequate ventilation and correct placement of hot-spot and high-voltage components, conservative design of all circuit elements, and self-limiting protection against brief overloads should result in a long, troublefree life in normal industrial service.

Polarity: Choise of positive or negative ground, by means of internal (readily accessible) jumper connections.

GENERAL DESCRIPTION

The R-Line high voltage DC power supplies are designed for industrial applications where reliability and long life are important. Adequate ventilation and correct placement of hot-spot and high voltage components, conservative design of all circuit elements, and self-limiting protection against rare operating conditions result in a long, trouble-free life in normal industrial service. Low corona levels are insured by proper rounding of components, and by the use of oil insulation above 30KV. RF interference to the power lines is effectively suppressed.

All R-Line power supplies are built in two parts; a control cabinet and a high voltage section. The control cabinet is a 24" relay rack for standard 19" wide panels, and is identical for all models. The high voltage housing is different for each model, depending on the voltage and current ratings of the supply. For low power units below 50KV rating, the high voltage components are built on a steel shelf which is mounted in the control cabinet. These units are completely contained on the panel, so that they can be removed from the cabinet supplied and test-operated externally.

For the high-power air-insulated models, a matching cabinet is supplied, containing the high-voltage components. The control cabinet is bolted onto the top of the high-voltage section, as a standard assembly. If desired, the two sections can be separated, enabling the controls to be situated at a location remote from the high-voltage cabinet.

The high-voltage section for 50KV-and-over models is housed in an oil-filled tank. This tank has been designed to provide adequate cooling. An angle-iron frame is attached to the tank cover, and is used to mount the high-voltage components. When the cover is unbolted from the tank and lifted, the entire high-voltage section is removed from the oil. Port holes are provided in the cover for quick replacement of tubes, and for removing polarity. Openings in the cover allow for easy handling of the entire tank, or the frame alone. The cover is self-gasketed, enabling the unit to be moved without danger of spilling oil. A 20-foot interconnecting cable has been provided for remote operating of the high-voltage unit.

Meters: Two rectangular 4-½" meters are provided on the control panel. The kilovoltmeter has three ranges: 25%, 50% and 100% of rated output voltage. The milliameter has ranges of 10%, 40% and 100 of rated output current. These meters are hand-calibrated to 2% at the factory, and can be recalibrated at any time by screw driver-adjustable potentiometers which are part of the meter circuit.

Both meters are fully protected against overload on each range, and also when switching between ranges, by neon gaps. The kilovoltmeter reads the output voltage through a multiplier resistor connected

Meters: (Milli. and Kilo. out.)

Directly to the high-voltage output terminal, to assure a load voltage reading unaffected by internal regulation. The load current is measured in the ground return of the high voltage circuits. The kilovoltmeter current drain does not affect the milliameter reading since the kilovoltmeter ground return is connected beyond the milliameter in the ground return circuit.

Polarity:

A pair of bus bar jumpers in the high voltage section permit reversing the polarity of the output voltage as desired.

Protective Devices:

Over-voltage and over-current protective devices are provided which automatically open the primary circuit when the output voltage or current exceeds the preset cut-value. The high-voltage is immediately shut off and an appropriately identified warning lamp on the front panel is illuminated. A reset button on the panel permits restoration of the circuits to pre-operation condition after correction of the fault.

[illegible]

This device is push-button controlled, and serves to prevent the supply from automatically re-energizing after a line failure, blown fuse, overload, etc., has been corrected. When its holding circuit is interrupted, the contactor opens and will remain open until the HIGH VOLTAGE START button is pressed.

Set to "0" Interlock:

This device prevents energizing the equipment, unless the voltage control knob is first turned back to zero, precluding the possibility of sudden application of high potentials. Each time the unit is energized, the output voltage will be initially zero, and must be raised to the desired potential by rotating the voltage control knob.

Output Shorting Switch:

[illegible] gravity-operated switch immediately short-circuits the output capacitors, removing the possibility of damage or injury that might result from accidental contact with output terminals of load circuit.

The schematic diagram for the power supply will be found on a fold-out page at the rear of this manual. The circled numbers refer to this diagram.

The heart of the power supply is the high-voltage transformer T2, centred portion of the schematic diagram. All 3-line units except the K-15 and K-16 utilize the full-wave voltage-doubler rectifier circuit, which includes a plate transformer T2, two rectifier tubes V1 and V2, and filter capacitors C4 and C5. Model K-15 and K-16 use a full wave bridge rectifier circuit consisting of a plate transformer T2, four rectifying diodes V1a, V1b, V1c, and V1d, and a single filter capacitor C4.

When the equipment is fully operative, 115-volt, 60-cycle power is applied to the primary of variable autotransformer T1. The variable output voltage is applied to the primary of plate transformer T2, which steps up this voltage to a high value and applies it to the rectifier tubes. The pulsating dc output of the rectifier stage is filtered by the smoothing choke and capacitor(s) and applied through terminal 11 and the output terminal to the external load. The meter shunt R11 limits the load current to a safe value in the event of an external short-circuit. Spark gap SG1 or SG2, where used, provides a low-impedance path to ground for any excessive voltage that may appear between the high-potential secondary and earthed primary of the transformers.

The remaining circuit elements serve to initiate and control, monitor and safeguard the above high-voltage circuits, as explained in the following paragraphs.

1. Application of Primary Power

Closing the LINE POWER switch S1 energizes the filaments of the rectifier tubes, and transmits power to the interlock circuits. With the cabinet door interlocks (S6 and S7) properly closed, and the external safety interlock circuit closed (jumper in J3 if external power is not connected through the primary terminal), then VOLTAGE STOP-RESET push-button S2, the METER POLARITY SWITCH switch S5, and the capacity-start capacitor C1 are energized, and over-current holding relays K2 and K4 to the HIGH-VOLTAGE READY (green) indicator lamp I5.

2. Contactor and SET TO "0" INTERLOCK Circuits:

Microswitch S4 is ganged with HIGH VOLTAGE CONTROL T1, and is closed when the control knob of T1 is turned to its extreme counter-clockwise (zero) position. If the HIGH VOLTAGE START push-button S3 is pressed when T1 is not at zero, the SET TO "0" interlock neon indicator lamp I4 lights. The K1 coil is not energized. However, S4 is closed, and the power contactor K1 is energized

when S3 is pressed. The holding contact of contactor K1 bypasses both S3 and S4, so that K1 remains energized after the push-button is released and the T1 control knob has been rotated away from zero position. The main contacts of K1 connect line power to the primary of auto-transformer T1, and energize the HIGH VOLTAGE ON (red) indicator lamp I5 [illegible] zero and the rated maximum voltage.

When The HIGH VOLTAGE START push-button is pressed, the OUTPUT CURRENT meter M2 and the over-current relay K5 are temporarily disconnected from the load circuit, to avoid damage or shut-down due to charging currents.

3. Output Shorting Switch

which is then held by the same holding circuit as is the main contactor K1. In the de-energized position, K6 short-circuits the high-voltage output terminals of load circuits during shut-down periods. When K6 is energized, this short circuit is removed, but since the relay armature return is gravity-operated, it stands ready to reapply the short circuit immediately upon interruption or failure of the supply. Resistor R13 limits the short-circuit capacitor discharge current to a nondestructive value.

4. Over-Voltage Circuit.

Relay K3 is connected in series with multiplier resistor R12 and [illegible] when the output voltage of the supply exceeds the rated maximum by any chosen amount up to 25%. When K3 closes its contacts, the coil of relay K2 is energized. Examination of the relay circuits will show that this causes the OVER-VOLTAGE (amber) indicator lamp I7 to light, holds the coil of K2 in the energized condition, and shuts down the high voltage by de-energizing K1 and K6. To restore the equipment to operation, it is then necessary to return the voltage control knob back to zero, press the HIGH VOLTAGE STOP-RESET button, and then press the HIGH VOLTAGE START push-button S3.

5. Overcurrent Circuit

Relay K4 is actuated by [illegible] of the contacts of relay K5, which is energized when the load current exceeds a set value. This value can be adjusted between 30% and 150% of the rated maximum output current by means of rheostat R9, and R10.

When K4 is energized it lights the OVERCURRENT (amber) indicator

[illegible] relay K1 [illegible] down the high voltage circuits. After [illegible] excessive current drain, the equipment may be restored as [illegible] as outlined for the over-voltage circuit above.

6. Metering Circuits

The voltmeter is connected in series with multiplier resistors R12 and R2 direct to the high-voltage output terminal, to accurately monitoring the load voltage [illegible] introducing variations due to the regulation of the power supply. The voltmeter is returned to a point beyond the ammeter on the ground return, so that the current drawn by the voltmeter will not be registered on the ammeter.

The ammeter is connected in series with the ground return of the external load, and reads actual load current rather than total supply current.

Each meter is equipped with [illegible] For each of the three meter ranges, [illegible] of the meters at regular periods.

7. Polarity Control

[illegible] pair of [illegible] and P201 on the [illegible] plugs are so arranged that the [illegible] 90 degrees, and reinserted [illegible] polar [illegible] is then restored to the [illegible] still read up-scale for an increase in current, as before. [illegible] change in the meters in case [illegible] rotated.

8. Neon Protectors

Neon lamps I3 and I11 are [illegible] ammeter M3 and voltmeter M2 respectively, and are [illegible] excessive voltage appears across the meters they protect. When the voltage reaches the firing potential of the neon gas, the lamp acts as a low impedance, and [illegible] small currents which might otherwise damage the [illegible] components.

INSTALLATION INSTRUCTIONS

1. Remove the shorting wires from the meter terminals.

2. Install the NE-32 neon glow lamps in the receptacles on the control panel.

3. FOR AIR-INSULATED UNITS

   a. Cut the cords used to secure the plate leads for shipment.
   b. Cut the cords used to secure the solenoid plunger.
   c. Install the rectifiers in their sockets, and clamp [illegible] tube clamps (clamps not supplied [illegible] rectifiers).
   d. Connect the plate leads to the [illegible] tubes.

4. FOR OIL-INSULATED UNITS

   a. Lift the frame and cover out of the tank and set the unit down.
   b. Cut the cords used to secure the plate leads for shipment.
   c. Cut the cords used to secure the solenoid plunger.
   d. Install the rectifiers in their sockets.
   e. Connect the plate leads to the plate caps of the rectifier tubes.
   f. The tank is provided with fittings for valves, and these may be installed if desired. If not, oil may be poured in directly through the top, and pumped, syphoned, or bailed out when required.
   g. Fill the tank to the oil level line on the inside of the tank (about 2-1/2" from the top) with high grade transformer oil of at least 25KV test rating. When pouring the oil in through the top, avoid splashing as much as possible, since this causes aeration of the oil. When pumping, the oil should enter at the lower valve fitting.
   h. Install the ground cable in the jack on the frame and screw the clamp fitting down on the cover.
   i. Lower the frame and cover into the tank slowly to avoid splashing.
   j. Bolt the lid down, using a hand wrench to tighten the bolts.
   k. Screw the interconnecting cable in place at both the control chassis and tank ends.

5. [illegible] that the gasket-clamp [illegible] is tight.

6. Wire the Cinch-Jones two-prong plug to an external safety switch. This switch should be shorted in the safe-operating position if no safety circuit is [illegible] then wire in a jumper across the terminals of the plug.

7. Check that the neon interlock plug is properly seated.

8. Wire the three-prong Bulgell plug to a source of [illegible] cycle, single-phase power. The [illegible] pin, larger than the other two, must be connected to a good external ground, the other two similar pins should be connected to the power source.

9. BE SURE TO GROUND THE EQUIPMENT TO A GOOD EARTH GROUND. Use at least 12 gauge wire.

10. a. Set the output voltage polarity jumpers as follows: (Refer to the PARTS PLACEMENT DIAGRAM drawing supplied for proper orientation of the and-bus bars.

b. Set the front panel METER POLARITY SELECTOR switch according

11. Set the OVER CURRENT "PICK UP" on the front panel to the desired tripping value by referring to the calibration curve dwg. sk-9. This graph is presented in terms of percentage of maximum rated supply current.

12. Over voltage adjustment is made directly on the relay 27. Increase the tension of the helical spring for higher voltage trip-out; reduce the tension for lower voltage trip-out. Use a small open-end lug wrench for the adjustment. Make initial setting of approximately 1/8 turn; then check to see if desired trip-voltage has been attained. When adjusting for trip voltage, it is necessary to turn the CONTACT SCREW very slow, since surges will produce an erroneous trop point. DO NOT TOUCH THE CONTACT POINTS ON THE RELAY.

NOTE: The following procedure assumes that the undervoltage and overcurrent relays have been adjusted for trip-out at the proper values, and that the output voltage polarity is correct. If these require readjustment, refer to Installation Instructions, paragraphs 10-12 above.

1. Connect the output cable to the load.
2. Rotate the high voltage control knob to zero position.
3. Place the LINE POWER switch in the ON position. The green HIGH VOLTAGE READY indicator should light if the interlock circuits are properly closed and the control knob is at zero. These can be checked by observing front panel indicators [illegible] the power line, and the HIGH VOLTAGE STOP pushbutton [illegible] indicator fails to light.

4. Press and release the HIGH VOLTAGE START pushbutton. The HIGH VOLTAGE ON indicator should light.
5. Set the METER RANGE SELECTOR switches ST and ST to the ranges appropriate to the intended output voltage and current.
6. Adjust the high voltage control knob to obtain the desired output conditions.
7. TO SHUT DOWN THE HIGH VOLTAGE CIRCUITS, [illegible] zero. Then press and release the HIGH VOLTAGE STOP pushbutton. The HIGH VOLTAGE ON indicator should be extinguished, and the HIGH VOLTAGE READY indicator should light. This shut-down procedure should be followed during normal operation. In an emergency, however, the HIGH VOLTAGE STOP pushbutton should be pressed without hesitation. It is desirable to leave the voltage polarity switch in position to discharge surges in the shorting mechanism.
8. To shut down the entire equipment, place the line power switch in the OFF position.
9. OVER-VOLTAGE OR OVER-CURRENT CONDITIONS: If an overload occurs during operation, the HIGH VOLTAGE ON indicator is extinguished, the OVERVOLTAGE OR OVERCURRENT lamp lights, reduce the voltage control knob to its zero position, then press and release the HIGH VOLTAGE STOP-RESET pushbutton. The HIGH VOLTAGE READY indicator will then light. Press and release the HIGH VOLTAGE START pushbutton. If proper operating conditions have been re-established, the HIGH VOLTAGE ON indicator will light and the HIGH VOLTAGE READY indicator will be extinguished.

DRAWING LIST

H-LINE SCHEMATIC, Dwg. aH-1

H-LINE WIRING DIAGRAM, Dwg. aH-2

H-LINE PARTS PLACEMENT CONTROL SECTION, Dwg. bH-3-CS

PARTS PLACEMENT HIGH VOLTAGE SECTION, Dwg. bH-3-HV

OVERCURRENT TRIP ADJUST CALIBRATION CURVE, Dwg. aH-4

BASIC PARTS LIST

H LINE POWER SUPPLIES

Part	
A1	Desk cabinet, 21-3/4" wide x 18" deep x 19-1/4" high for standard 17½" panel; MJE Finish Premier-DGH1[illegible] or Equiv.
A2	Panel; 19" wide x 17½" high; standerd WE notching; Steel; MJE Finish: Premier RP 1719.
A3	U-bracket as per dwg. D-HV9
A4*	High voltage Section housing
C1,2	0.01 Mfd-400 volt @ d, -RJ481, or equiv.
C3*	Capacitor
C4,5*	Capacitor
F1	Extractor post cartridge fuse, quick acting type: 250 volt AC; 3AMP; Littlefuse 3AG or equiv
F2*	As F1; rating on auxiliary parts list
I1,2	Neon glow lamp built into fuse holder XF1,2
I3,4	Neon glow lamp, 65 volt maintaining, 1/25 watt, Miniature bayonet base; NE51-T-3 1/4 bulb.
I5,6,7,8	Incandescent pilot lamp, 115 volt, 6 watt. Candelabra base; #68
I9,10	Neon glow lamp, 65 volt maintaining; 1 watt; double contact bayonet candelabra base; NE 32 G-10 bulb.
I11	Same as I3,4
J1	3 pole recessed male power receptacle: 125 volt 15 amps.
J2	Standard Flush female receptacle; 110 volt, 15 amps. 250 volt, 10 amp; Amphenol 61F1
J3,4	2 contact receptacle, Cinch-Jones S302-P
J5	9 contact receptacle;AMP102-22-168
J6*	AN connector
J7,8,9,10	Reversing Jacks, Birnbach #403
J11*	Jack
K1	Relay;115 volts AC coil; DPSTNO, 15 ampere 115 volt AC, contacts with auxiliary holding contact, Potter-Brumfield PR1766

*See auxiliary parts list (Sheet 4)

K1	Relay;115 volt, AC coil; DPDT, 8 amps.e, 115 volt AC contact; Potter-Brumfield [illegible]
K2	1/2 milliamp. DC., 8000 ohm coil; SPDT, 2 ampere, 115 volt AC contact; Sigma type 5F-80C08S
K4	Same as K2
K5	Same as K3
K6	Solenoid: 115 volt AC coil, 1" throw: GE9500A10032
M1	100 microamp DC full scale; 4" rect. bakelite case, Simpson Model 29 or equiv; for dial label see auxiliary parts list.
P1	3 pole female power connector, 125 volt, 15 amper; 250 volt, 10 ampere; Hubbel Twistlock 7555
P2	Not used
P3 *	2 contact plug; Cinch-Jones P302-CCT
P5	9 contact plug; AN3106-22-19S with clamp #3057-1
P6*	AN connector
P7 8,9,10	Reversing plugs, Birnbach #401
P11*	Plug
R1,2	350K ohm, 1 Watt, deposited carbon; 1% tolerance; IRC type DCF or equiv.
R3,4,5*	Resistor
R6	5 meg., 2 Watt, molded composition potentiometer; 120% tolerance; liner taper: screw driver slot, locking type shaft; Allen-Bradley CLU-2552
R7	0.5 Meg. as above; Allen-Bradley CLU-5041
R8	0.25 Meg. as above, Allen-Bradley CLU-1041
R9	50K, 2 Watt, W.W. Potentiometer; standard shaft; linear Clarostat 43C1-50K
R10, 11, 12, 13*	Resistor
S1*	Manual starter, with thermal overload portection; 2 pole, 230 volt AC rating; open type; Square D-2510A02; for overload unit, see auxiliary parts list.
S2	Momentary pushbutton switch; 2 circuits, 1 normally open, 1 normally closed, break before make; 10 amperes, 600 volts AC contacts; Red, Square D-9001-G03
S3	As above, Black, Square D-9001-G01
S4	Spring leaf switch; single pole, double throw, 15 amperes, 115 volt AC countacts; microswitch type BZ-2RI-A2
S5,6,7	Toggle interlock switch, momentary type, 10 amperes, 230 volt AC rating; GE 6 7460330 G4
S6	Rotary selector switch, 6 pole, 2 position, non-shorting; steatite insulation; Centralab 2517

* See auxiliary parts list (Sheet 4)

[illegible]	Rotary select selector switch; 1pole, 3 position, shorting, steatite insulation; Centralab PA 2000
[illegible]	Single phase, manual control Superior Electric Company Powerstat; for ratings and model, see auxiliary parts list
[illegible]	Plate Transformer
[illegible]	Filament Transformer
[illegible]	High voltage rectifiers
[illegible]	Output cable
[illegible]	Multi-conductor cable
[illegible]	Fuseholder, with built-in neon, Buss type HKI-R
[illegible]	See XF1,2
[illegible]	Pilot light holder with built-in resistor; for T-3¼ bulb; clear feced lens: Dialco type 98130 [illegible] or equiv.
[illegible]	Pilot light holder for S6 lamp; Green Jewel Dialco 51901-43 or equiv.
[illegible]	As above, red jewel
[illegible]	As above, amber jewel
[illegible]	As above, amber jewel
[illegible]	Pilot light holder for G10 lamp; Dialco (S-4634)
[illegible]	Pilot light holder for T-3¼ lamp; Dialco 98-4931-12
[illegible]	Tube Sockets
[illegible]	V1,2 plate caps
[illegible]	XV1,2 Anto-corona shield
[illegible]	Spark protectors
[illegible]	Output cable
[illegible]	Casters

*See auxiliary parts list (Sheet 4)

A4	High Voltage Regulator, [illegible] Frame and [illegible]
C3	Paper capacitor, 2 [illegible] Cornell Dubilier [illegible]
C4-5	Oil-filled capacitors, 0.005 mfd [illegible] Sprague used #Type 502-75M
[illegible]	[illegible]
CR3,4	Not used
CR5,-10	Flasherex protectors; Raytheon type [illegible]
EX1	H.V. cable terminal insulating material, [illegible] H.V. #RSMP-3; Cornell-Dubilier [illegible]
F2	15 amperes; Littel Fuse 340
J6	9 contact receptacle, [illegible]
J11	H.V. output jack; Birnbach [illegible]
M1	Scale reads 0-40/80/160 Milliamperes DC
M2	Scale reads 0-0.5/2.0/5.0 Milliamperes DC
S1-4	Cashews, 4" wheel, [illegible] Non Skirted bearings. Raytheon [illegible]
P6	9 Contact plug; AN3106 [illegible] Cinch Jones AN3057-12
P11	HV output plug; Birnbach #[illegible]
R3	250 K ohm-2W, wirewound potentiometer; 1% tolerance; linear taper; screw driver slot locking type shaft; Ohmite, type AB, #[illegible]
R4	25 K ohm-2W per above; Clarostat # 4302-25K
R5	10K ohm-2W, per above; Clarostat #4302-10K
R10	7.5 K ohm-10W, adjustable resistor, wirewound Ohmite #1036
R11 a-c	500 K ohm-10W, High voltage resistors; Resistance Products Co. type RHV 3 used
R12 a-f	50 M ohm-10W High voltage resistors; Resistance Products Co. type RHV 6 in series used
R13 a-f	7 M ohm-10W high voltage resistors; R. M. C. type RH-1 in series used

Parts List-Continued

heater element, 12 amperes; Square D-W16.7

115/0-135V @20 Amps. powerstat; Superior type 136

primary: tapped, 105/115/125V @60 cycles;
secondary: 55KV @80MA RMS start of Secondary insulated
for 75KVDC-under oil operated W. J. E. #[illegible]

Primary: 1.5V @60 cycles; tapped to give
Secondary: 6.0 @4.5 amps. and 6.0V @4.5 amps; 150 KV
[illegible] under oil operated. W. J. E. [illegible]

100 MA average current; 150 V peak inverse voltage; 6.0V
@ 5 Amps. filament. Eureka type [illegible]

15 feet of RG17 U coaxial cable #16 stranded, neoprene
covered.

Tube Socket; Eckhel #SP-8[illegible]

20 feet of multiconductor cable #16 stranded, neoprene
covered.

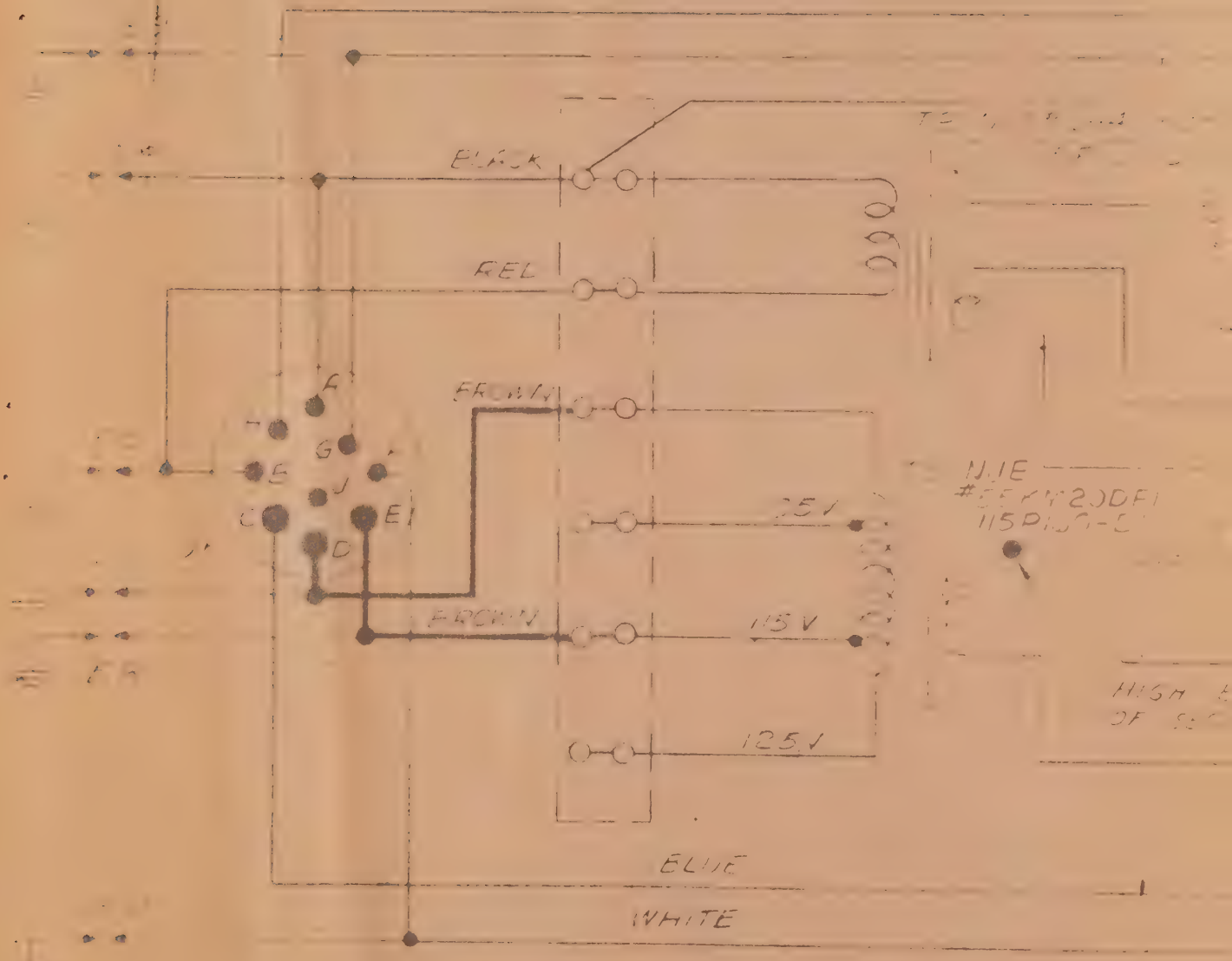
115 VAC INPUT
EXTERNAL GRD
P1
LVR
OPTIONAL EQUIPMENT
115 VAC INPUT
J1
J2
TO EXTERNAL GRD
115 VAC OUTLET
S1 LINE POWER
PROVISION FOR SOLID NEUTRAL
CONTROL FUSE
F1
I3 INTERLOCK OPEN
J3 "DOOR INTERLOCK"
J4 "SAFETY INTERLOCK"
P3
S5A S5B
DOOR INTERLOCKS IN CONTROL AND/OR HIGH VOLTAGE SECTION
S2 RESET HIGH VOLTAGE STOP (OVERVOLTAGE OR OVERCURRENT)
S6 METER POLARITY SELECTOR
(AMBER) OVERVOLTAGE
I7
K2
K4
I8
(AMBER) OVERCURRENT
K1
I5 (GREEN) HIGH VOLTAGE READY
S4 (INTERLOCKED WITH HIGH VOLTAGE CONTROL)
I4
SET TO O INTERLOCK OPEN
S3
HIGH VOLTAGE START
OVERCURRENT TRIP ADJUST
R9
C3
I9
S6 METER POLARITY SELECTOR
K5
I10
S7 METER RANGE SELECTOR
LOW
MED
HIGH
R3
R4
R5
MA
OUTPUT CURRENT M2
R1
J8
J9
POLARITY REVERSING
P7
P10
J7
J10
E5
E6
T3
V1
V2
C4
T2
C5
R11
R12
R13
E7
E8
E10
I11
J11
P11
E11
W1 HIGH VOLTAGE OUTPUT
K3
S8 METER RANGE SELECTOR
S6
M1 OUTPUT VOLTAGE
KV
R2
R6
R7
R8
(RED) HIGH VOLTAGE ON
I6
T1
C1
C2
PRIMARY FUSE
F2
I2
HIGH VOLTAGE CONTROL
PROVISION FOR SOLID NEUTRAL

T3
J7
J10
R11
V1a
V1b
C4
T2
J9
V2a
V2b

HIGH VOLTAGE CIRCUIT-MODEL H15 & H16 ONLY

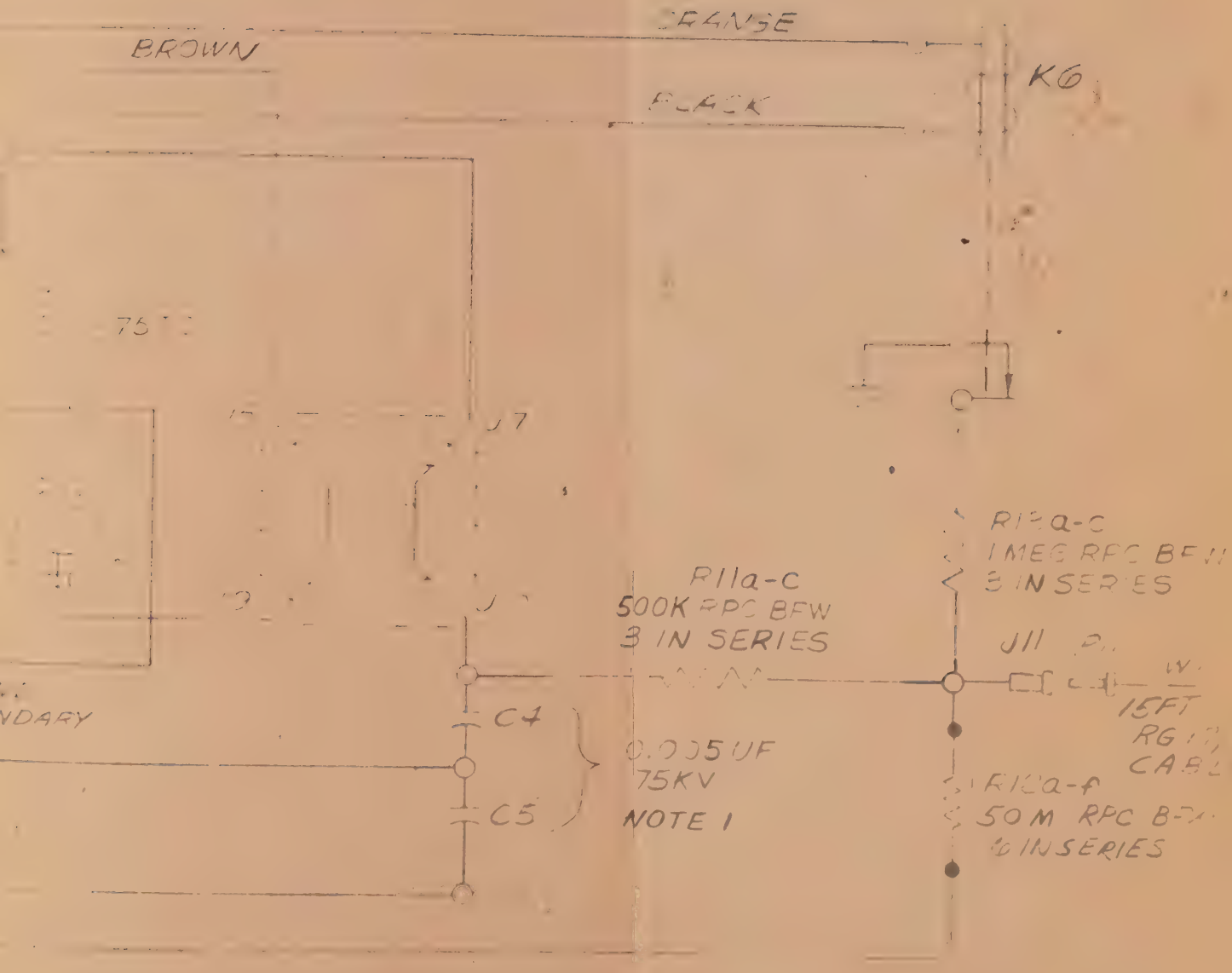
NOTES
1. E5-E10 NOT USED IN SINGLE CABINET MODELS.
2. J11 & P11 USED IN OIL INSULATED MODELS ONLY.

DESIGNER	N.J.E. CORPORATION
DRAWN BY	345 CARNEGIE AVE. KENILWORTH, N.J.
DATE 3-13-5[illegible]	H-LINE
APPROVED BY	SCHEMATIC DIAGRAM
CHECKER	DWG. NO H1 ISSUE
	SHEET OF SHEETS



NO. 14 GAUGE

NO. 18 GAUGE



N.J.E. CORPORATION

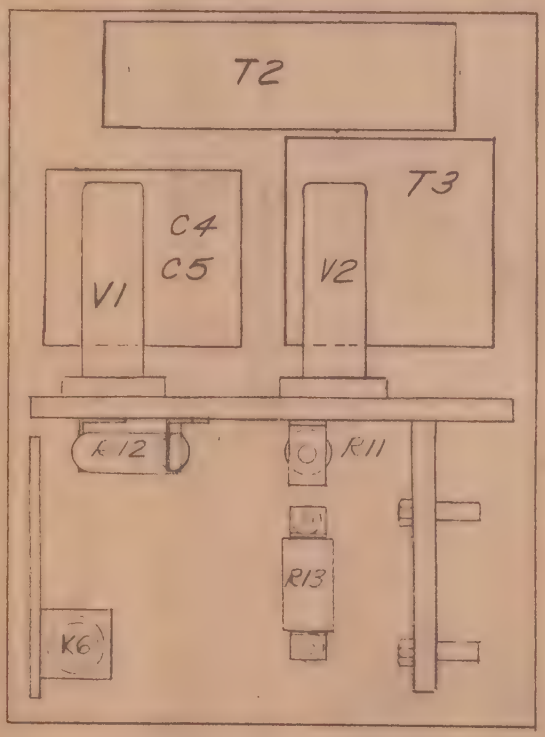
HIGH VOLTAGE
SECTION WIRING DIAGRAM

b H2a-H-90-1B

ISSUE

J

THESE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF NJE CORPORATION AND SHALL NOT BE REPRODUCED, OR COPIED, OR USED AS THE BASIS FOR MANUFACTURE OR SALE OF APPARATUS WITHOUT PERMISSION.



—TOP VIEW—

NEXT ASSY	USED ON	REQD
APPLICATION		

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES

TOLERANCES ON FRACTIONS	DECIMALS	ANGLES
±1/64	±.005	±1/2°

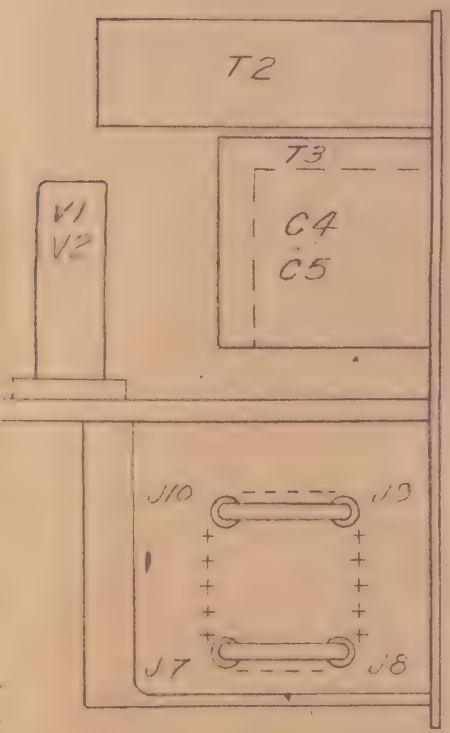
MATERIAL

PROTECTIVE FINISH

OGILVIE PRESS, INC., BROOKLYN 17, N. Y.

200-802 REV 2

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
2	RE DRAWN (6-4-3-H)	8-26-63	[illegible]



SIDE VIEW

DRAFTSMAN AMG	DATE 8-26-63	TITLE H-LINE PARTS PLACEMENT HIGH VOLTAGE SECTION	NJE CORPORATION KENILWORTH, N. J.
DESIGNER			
CHECKER [illegible]	[illegible]		
ENGINEER			
APPROVED			
DO NOT SCALE DWG		SCALE — FIGURE 4	DWG SIZE B — 200-802 — SH 1 OF 2

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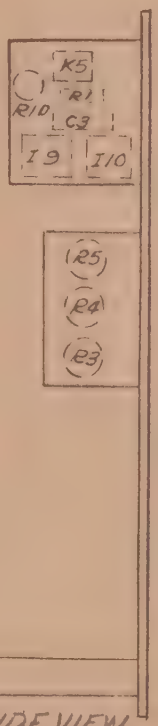
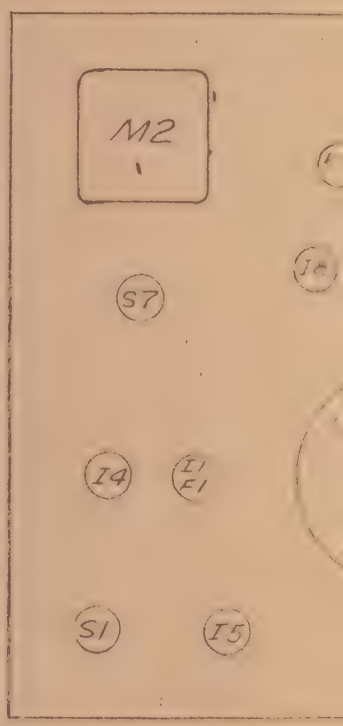
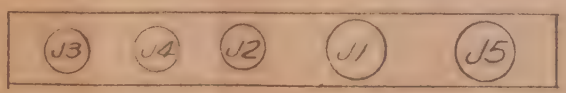


LEFT SIDE VIEW





REAR VIEW OF CHASSIS

NEXT ASSY	USED ON	REQD

APPLICATION

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES
TOLERANCES ON

FRACTIONS	DECIMALS	ANGL
±1/64	±.005	±1/2°

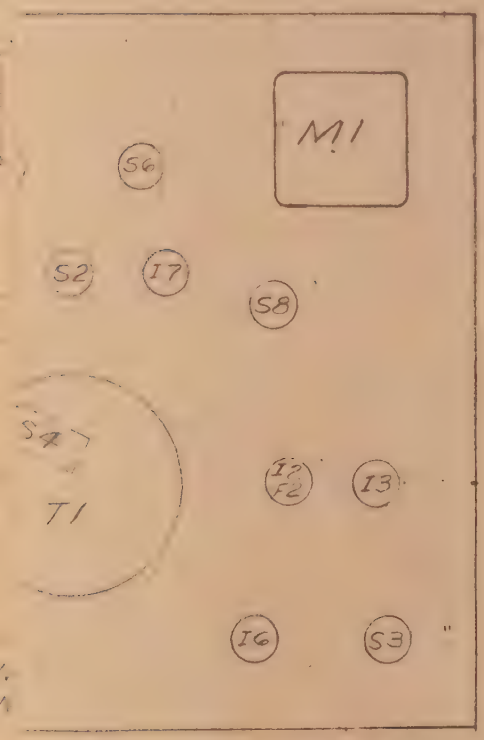
MATERIAL

PROTECTIVE FINISH

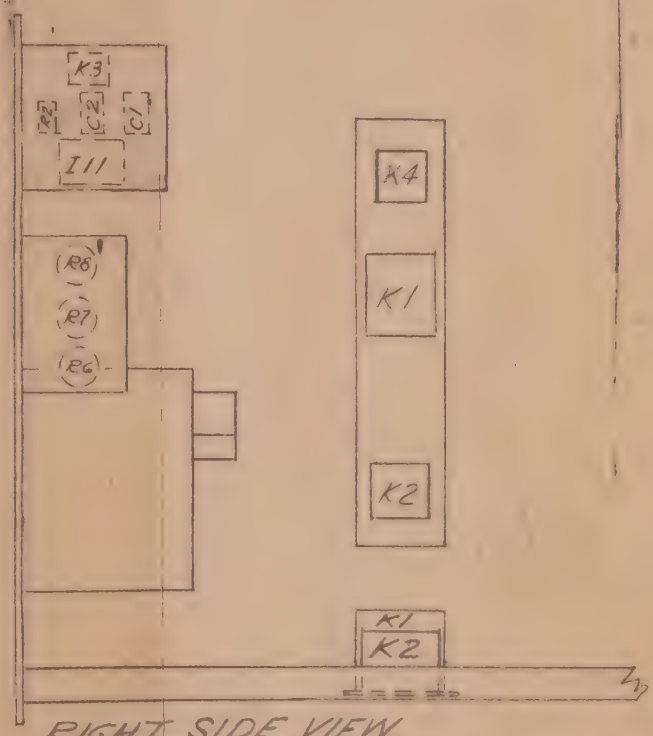
SILVIE PRESS, INC., BROOKLYN 17, N. Y.

200-802 REV 2

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
2	REDRAWN (6H-3-CS)	8-26-58	



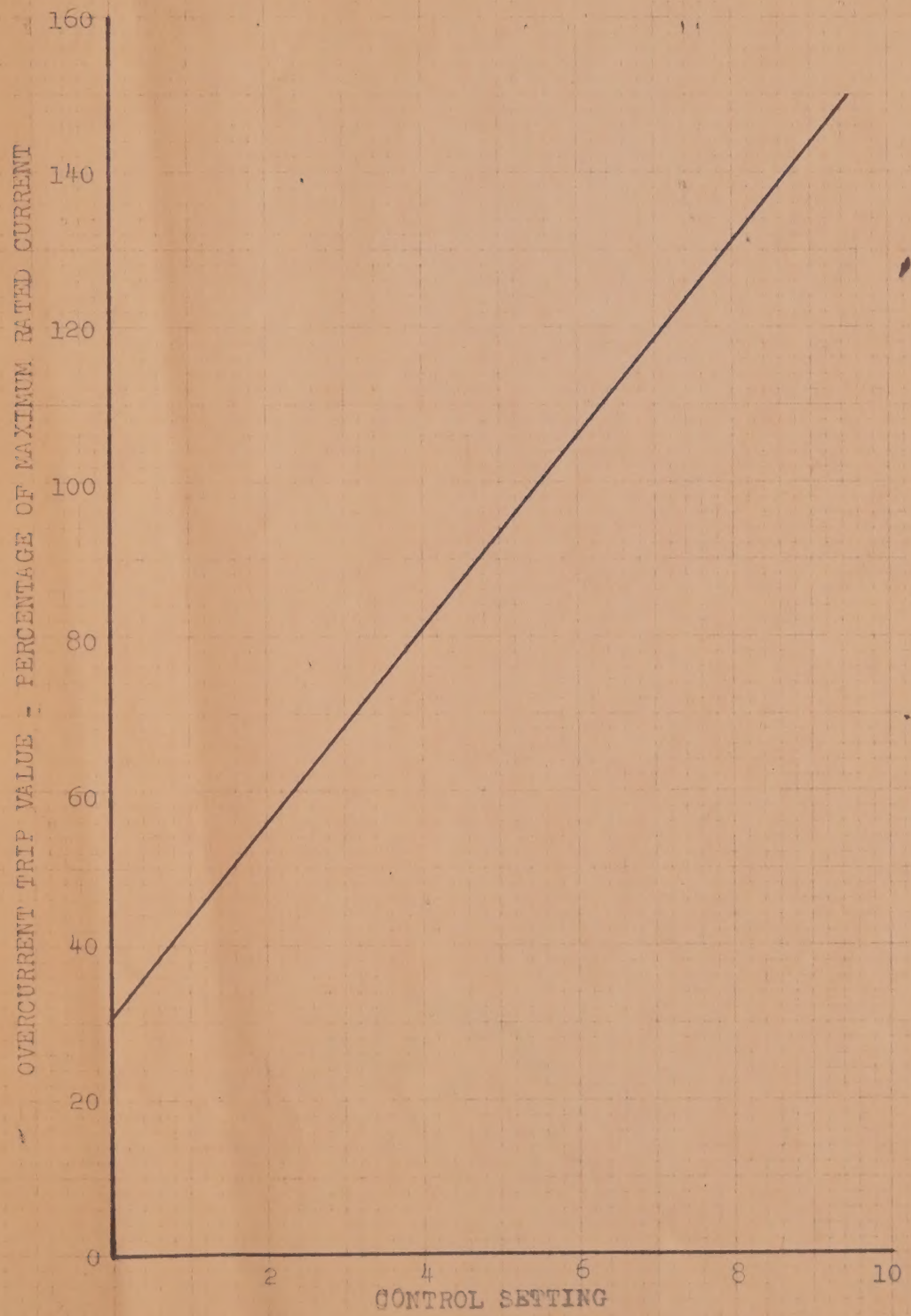
FRONT VIEW



RIGHT SIDE VIEW

DRAFTSMAN: AMG	DATE: 8-26-58	TITLE: H-LINE PARTS PLACEMENT CONTROL SECTION	NJE CORPORATION KENILWORTH, N. J.
DESIGNER			
CHECKER: HH	8-26-58		
ENGINEER			
APPROVED			
DO NOT SCALE DWG		SCALE — FIGURE 5	DWG SIZE: B — 200-802 — SH 2 OF 2

ALL CONTROL SETTINGS APPROXIMATE



OVERCURRENT TRIP ADJUST CALIBRATION CURVE

N J E CORP

DWG NO. H-4

OUR WARRANTY: N J E Corp. warrants each power supply manufactured by them to be free from defects in material and workmanship. Our liability under this warranty is limited to servicing or adjusting any instrument returned to the factory for that purpose and to replacing any defective parts thereof, except tubes and fuses in "standard-grade" models. This warranty is effective for one year after delivery to the original purchaser when the instrument is returned, transportation charges prepaid by the original purchaser, and which upon our examination is disclosed to our satisfaction to be defective. If the fault has been caused by misuse or abnormal conditions of operation, repairs will be billed at cost. In this case, an estimate will be submitted before the work is started.